Appendix I

In developing the emission inventories used for modeling, ARB staff first prepared "baseline" modeling inventories – using data from the California Emissions Forecasting System (CEFS). However, to improve characterization of some specific sources, specific adjustments were made to the baseline inventory. These are termed "external, baseline adjustments". These adjustments were applied via two sets of factors. This appendix provides documentation for the second set of adjustment factors, referred to as Adjustment 2, to reflect improvements to the inventory for San Joaquin Valley.

Dairy and Feedlot Cattle Dust. Two adjustments were made to this category:

- The temporal allocation of emissions was adjusted. **Section I.1** provides additional details.
- A second adjustment was made to update the size cut data used for this category. **Section I.2** provides additional details.

Food and Agriculture Processing Loss. One adjustment was made to this category:

- Updated the size cut data. **Section I.3** provides additional details.

Managed Burning. Three adjustments were made to this category:

- One adjustment is intended to reflect actual permitted burning based on data gathered by district staff. Original emission estimates overestimated the amount of agricultural burning that actually occurred over the last few years.
- A second adjustment is to reflect reductions in orchard removal and rice stubble due to SJVUAPCD District Rule 4103.
- A third adjustment reflects a change in temporal allocation for WFU emissions. **Section I.4** provides more detail on the temporal adjustment for WFU emission estimates.

Manufacturing and Industrial. Two adjustments were made to this category:

- One adjustment is intended to reflect SJVUAPCD Rule 4307 that limits the emissions from small boilers, steam generators, and process heaters as estimated in Table B-1 of the districts' Draft 2008 PM2.5 plan.
- A second adjustment provides details on the inventory update for Industrial Natural Gas Combustion provided by SJVUAPCD. **Section I.5** provides additional detail.

Cooking. One adjustment was made to this category:

- **Section I.6** provides details on the inventory update for Cooking provided by SJVUAPCD.

Paved Road Dust. Two adjustments were made to this category:

- One adjustment removes double-counting of exhaust, tire wear, and brake wear $PM_{2.5}$;
- The second adjustment revises the growth rate. **Section I.7** contains additional details on these two adjustments.

Residential Fuel Combustion.

- This adjustment is intended to reflect SJVUAPCD Rule 4901 that limits the growth of the number of wood burning fireplaces and wood burning heaters.

Service and Commercial

- This adjustment is intended to reflect SJVUAPCD Rule 4308 that limits the emissions from small boilers, steam generators, process heaters and water heaters as estimated in Table B-1 of the districts' Draft 2008 $PM_{2.5}$ plan.

Glass Manufacturing

- This adjustment is intended to reflect SJVUAPCD Rule 4354 that will reduce SO_X emissions from glass-melting furnaces.

Section I.1

Update to Temporal Data for Dairy and Feedlot Cattle Dust

1. Purpose

The monthly distribution of dust emissions from dairy cattle and feedlot cattle was improved. The issue that prompted this improvement is that the monthly temporal data in CEIDARS/CEFS that are used to allocate dust emissions from dairy cattle and feedlot cattle are distributed evenly every month, which does not reflect the seasonal effects of rainfall.

Rainfall suppresses the dust generated by cattle. The most recent version of EPA's AP-42[1] includes a rainfall correction factor for unpaved road dust emissions. It is assumed that the temporal distribution for dust generated by cattle follows the same pattern as for unpaved road dust. In the AP-42 methodology, the rainfall correction zeros out the unpaved road dust emissions on days in which there is measurable rainfall. On an annual basis, the rainfall correction factor equation is: $EF_{rain} = EF\ [(365-P)/365]$, where P equals the number of days in a year with over 0.01 inches of precipitation.

For our estimates, we used monthly precipitation data[2] for each county in the SJV. This helped provide county-specific estimates as well as providing a monthly profile. This correction effectively reduces the dust emissions by an amount related to the monthly rainfall. The area source methodology that describes the calculation of unpaved road dust emissions is available on ARB's website[3].

2. EIC Codes Affected

CES	EIC	Description
89516	620-618-0262-0101	Livestock Husbandry – Dairy Cattle
89532	620-618-0262-0103	Livestock Husbandry – Feedlot Cattle

Emissions from this EIC are reported solely as area sources; no reconciliation with point sources is necessary.

3. Emission Inventory Changes from this Update

Annual average emissions from this category remain unchanged. Table 1 shows the change in the monthly $PM_{2.5}$ emissions (tons/day) for both dairy and feedlot cattle dust in the SJV for 2000. Tables 2 and 3 show the emission changes for 2005 and 2014, respectively.

Table 1: SJV Dairy and Feedlot Cattle Dust Emissions (tpd) – 2000

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Original $PM_{2.5}$	6.88	6.88	6.88	6.88	6.88	6.88	6.88	6.88	6.88	6.88	6.88	6.88
Revised $PM_{2.5}$	5.85	5.32	6.19	6.66	7.46	7.58	7.97	7.97	7.45	7.43	6.44	6.27
Change from Original	-1.03	-1.56	-0.69	-0.23	0.58	0.70	1.09	1.09	0.57	0.55	-0.45	-0.61

Table 2: SJV Dairy and Feedlot Cattle Dust Emissions (tpd) – 2005

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Original $PM_{2.5}$	7.43	7.43	7.43	7.43	7.43	7.43	7.43	7.43	7.43	7.43	7.43	7.43
Revised $PM_{2.5}$	6.31	5.74	6.68	7.18	8.06	8.19	8.60	8.60	8.05	8.02	6.95	6.76
Change from Original	-1.12	-1.69	-0.75	-0.24	0.63	0.76	1.18	1.18	0.62	0.59	-0.48	-0.67

Table 3: SJV Dairy and Feedlot Cattle Dust Emissions (tpd) – 2014

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Original $PM_{2.5}$	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56
Revised $PM_{2.5}$	7.26	6.61	7.70	8.28	9.29	9.44	9.92	9.92	9.28	9.25	8.00	7.78
Change from Original	-1.30	-1.95	-0.86	-0.28	0.73	0.88	1.36	1.36	0.72	0.69	-0.56	-0.78

Note that for all three tables, the sum of the changes for January through December add to zero (0), confirming that the annual average emissions are unchanged. Table 4 shows the changes in the summer and winter planning inventories for each of the three years. The summer planning inventories are the average of May through October and the winter planning inventories are the average of November through April.

Table 4: SJV Summer and Winter Planning Inventory $PM_{2.5}$Emissions (tpd) – Cattle Dust

	2000		2005		2014	
	Summer	Winter	Summer	Winter	Summer	Winter
Original $PM_{2.5}$	6.88	6.88	7.43	7.43	8.56	8.56
Revised $PM_{2.5}$	7.64	6.12	8.25	6.61	9.51	7.61
Change from Original	+0.76	-0.76	+0.82	-0.82	+0.95	-0.95

4. Methodology Description

Table 5 shows the current annual average $PM_{2.5}$emissions (tons per day) for dairy and feedlot cattle dust by county in the SJV. The monthly temporal data in CEIDARS/CEFS, shown in Table 6, are uniform over each month and uniform over the 7 days of the week. Therefore, the emissions shown in Table 5 would also be the same in the modeling inventories for each month for both a weekday and a weekend day.

Table 5: Current Annual Average $PM_{2.5}$ Emissions (tpd) for Cattle Dust

County	EIC	2000	2005	2014
FRESNO	620-618-0262-0101	0.261	0.304	0.393
KERN	620-618-0262-0101	0.182	0.211	0.274
KINGS	620-618-0262-0101	0.381	0.444	0.574
MADERA	620-618-0262-0101	0.111	0.130	0.168
MERCED	620-618-0262-0101	0.586	0.683	0.883
SAN JOAQUIN	620-618-0262-0101	0.281	0.328	0.424
STANISLAUS	620-618-0262-0101	0.460	0.536	0.693
TULARE	620-618-0262-0101	1.05	1.22	1.581
FRESNO	620-618-0262-0103	1.347	1.347	1.347
KERN	620-618-0262-0103	0.360	0.360	0.360
KINGS	620-618-0262-0103	0	0	0
MADERA	620-618-0262-0103	0.230	0.230	0.230
MERCED	620-618-0262-0103	0	0	0
SAN JOAQUIN	620-618-0262-0103	0	0	0
STANISLAUS	620-618-0262-0103	0.837	0.837	0.837
TULARE	620-618-0262-0103	0.797	0.797	0.797

Table 6: Current Relative Monthly Throughputs for Cattle Dust Categories

County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fresno	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33
Kern	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33
Kings	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33
Madera	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33
Merced	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33
San Joaquin	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33
Stanislaus	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33
Tulare	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33	8.33

External adjustment factors were calculated (see Section 5 below) to adjust the emissions as if the monthly throughputs were as shown in Table 7, which reflect SJV unpaved road dust emissions corrected for rainfall. Table 8 shows the rainfall data by county and month that was used to develop the relative monthly throughputs shown in Table 7. The rainfall data were collected by ARB staff in December 2002 in consultation with SJVAPCD staff. The data were retrieved from the historical climate information within the Western Regional Climate Center[2].

Table 7: Revised Relative Monthly Throughputs for Cattle Dust Categories

County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fresno	7.26	6.58	7.50	8.12	8.98	9.10	9.53	9.53	8.92	8.92	7.81	7.75
Kern	7.25	6.52	7.62	7.92	8.90	9.14	9.45	9.45	8.84	9.02	7.98	7.92
Kings	7.34	6.57	7.65	7.95	8.87	9.17	9.48	9.48	8.87	8.87	7.95	7.80
Madera	7.14	6.52	7.45	8.07	9.01	9.01	9.63	9.63	9.01	9.01	7.76	7.76
Merced	6.61	6.37	7.48	8.20	9.24	9.32	9.87	9.87	9.24	9.08	7.64	7.09
San Joaquin	6.61	5.96	7.41	7.98	9.11	9.35	9.99	9.99	9.35	9.11	7.66	7.49
Stanislaus	6.95	6.32	7.38	8.01	9.17	9.17	9.80	9.80	9.17	9.06	7.69	7.48
Tulare	7.14	6.44	7.53	8.07	9.00	9.23	9.62	9.62	9.00	9.00	7.84	7.53

Table 8: Average Rainfall for SJV Counties by Month

County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fresno	7.4	6.6	6.6	3.6	1.8	0.4	0	0	1.0	2.0	4.6	5.8
Kern	7.2	6.6	6.0	4.0	1.8	0.0	0	0	1.0	1.4	3.8	5.0
Kings	7.0	6.5	6.0	4.0	2.0	0.0	0	0	1.0	2.0	4.0	5.5
Madera	8.0	7.0	7.0	4.0	2.0	1.0	0	0	1.0	2.0	5.0	6.0
Merced	10.3	8.0	7.5	4.3	2.0	0.8	0	0	1.0	2.5	6.0	8.8
San Joaquin	10.5	9.5	8.0	5.3	2.8	1.0	0	0	1.0	2.8	6.3	7.8
Stanislaus	9.0	8.0	7.7	4.7	2.0	1.0	0	0	1.0	2.3	5.7	7.3
Tulare	8.0	7.3	6.8	4.0	2.0	0.3	0.0	0.0	1.0	2.0	4.8	6.8
SJV Average	**8.4**	**7.4**	**6.9**	**4.2**	**2.0**	**0.6**	**0.0**	**0.0**	**1.0**	**2.1**	**5.0**	**6.6**

5. Development of Off-Model Adjustments

The external adjustment factors are multiplied by the current gridded emissions to incorporate the desired change in the inventory. The factors are calculated for a given county, month, year and pollutant. To reflect the revised monthly throughputs given in Table 7, ratios were calculated from the revised throughputs to the current throughputs by county. In other words, the monthly ratios in Table 9 were calculated by taking the throughput for each county and month from Table 7 and dividing them by the comparable throughputs in Table 6. The same ratio is applied to all pollutants and years for both the dairy and cattle feedlot dust categories. Table 9 shows the external adjustment factors for each of the eight counties.

Table 9: External Adjustment Factors for SJV Counties by Month

County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fresno	0.871	0.790	0.900	0.974	1.078	1.092	1.144	1.144	1.070	1.070	0.937	0.930
Kern	0.870	0.782	0.914	0.951	1.068	1.097	1.134	1.134	1.060	1.082	0.958	0.951
Kings	0.881	0.789	0.917	0.954	1.064	1.101	1.138	1.138	1.064	1.064	0.954	0.936
Madera	0.857	0.783	0.894	0.969	1.081	1.081	1.155	1.155	1.081	1.081	0.932	0.932
Merced	0.793	0.764	0.898	0.984	1.108	1.118	1.185	1.185	1.108	1.089	0.917	0.850
San Joaquin	0.793	0.716	0.890	0.957	1.093	1.122	1.199	1.199	1.122	1.093	0.919	0.899
Stanislaus	0.835	0.759	0.885	0.961	1.100	1.100	1.176	1.176	1.100	1.088	0.923	0.898
Tulare	0.857	0.773	0.903	0.968	1.080	1.108	1.154	1.154	1.080	1.080	0.940	0.903

6. Sample Calculations

The algorithm to calculate month-specific emissions in CEFS is as follows:

$$\text{Daily Emissions} = \frac{\text{EMS}}{365} * \frac{\text{Monthly Throughput}}{(1/12)} * \frac{\text{DAYFACTOR}}{(1/7)} \quad \text{(Equation 1)}$$

The variable EMS represents annual average emissions (tons/year). The monthly throughput stored in CEIDARS/CEFS is multiplied by 100 for ease of reporting, so the monthly throughputs reported in CEFS must be divided by 100 before use in equation 1. DAYFACTOR varies depending on the weekly cycle code (DPWK) and whether a weekday or a weekend day is desired. When the weekly cycle code is 7, DAYFACTOR = 1/7 cancelling out any emissions adjustment for day of week.

Current Calculations

Annual average $PM_{2.5}$ emissions in Fresno County in 2000 from dairy cattle are 0.261 tpd (see Table 5). The weekly cycle code for this category is 7. Using equation 1 above, calculate the $PM_{2.5}$ emissions for a weekday in January. The emissions for all months and days of week in 2000 will be identical to the January weekday calculated below.

January weekday = 0.261 * 0.0833/0.0833 * 1 = 0.261 tpd PM2.5

Revised Emissions

The annual average $PM_{2.5}$ emissions remain unchanged. The amount of emissions in a particular month will be different. Calculate the revised $PM_{2.5}$ emissions in Fresno in 2000 for a January weekday by multiplying the annual average emissions from Table 5 by the appropriate adjustment factor from Table 8. As a double check, use equation 1 to calculate the emissions that CEFS would have calculated had the temporal data been revised in the database.

Using external adjustments:
Revised January Weekday in Fresno = 0.261 tpd * 0.871 = 0.227 tpd $PM_{2.5}$

Using equation 1:
Revised January Weekday in Fresno = 0.261 * 0.0726/0.0833 = 0.227 tpd $PM_{2.5}$

References

1. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, AP-42, Section 13.2.2, Fifth Edition. December 2003. http://www.epa.gov/ttn/chief/ap42/ch13/

2. Western Regional Climate Center. http://www.wrcc.dri.edu/

3. Gaffney, Patrick. California Air Resources Board. Area source methodology for unpaved road dust, non-farm roads, SJV only. May 2004. http://www.arb.ca.gov/ei/areasrc/fullpdf/FULL7-10.pdf

Section I.2

Update to Size Cut Data for Dairy and Feedlot Cattle Dust

1. Purpose

The distribution of dust emissions into different PM size cuts from dairy cattle and feedlot cattle was improved by reassigning the PM profile that is currently used (#900) to a more representative profile (#423). A PM profile is an estimate of the fraction (weight percent) of source-specific PM considered to be within a specific particle size range. For example, a profile could identify the fraction of PM emissions from feedlot cattle that is particulate matter less than 2.5 microns ($PM_{2.5}$).

The issue that prompted this improvement is that the currently assigned PM profile (#900) is an "unspecified" profile, which is only intended to be used as a default when more specific data are unavailable. Another PM profile (#423) is more suitable for dust emissions from dairy and feedlot cattle. The "unspecified" PM profile (#900) assigns a weight fraction of 0.42 to $PM_{2.5}$, while PM profile #423 assigns a weight fraction of 0.055 to $PM_{2.5}$, thus reducing the amount of $PM_{2.5}$ emissions from these categories. PM profile #423 was based on sampling collected at a dairy in the Visalia area by OMNI Environmental Services and Desert Research Institute in a study sponsored by the ARB[1].

2. EIC Codes Affected

CES	EIC	Description
89516	620-618-0262-0101	Livestock Husbandry – Dairy Cattle
89532	620-618-0262-0103	Livestock Husbandry – Feedlot Cattle

Emissions from this EIC are reported solely as area sources; no reconciliation with point sources is necessary.

3. Emission Inventory Changes from this Update

Annual average, summer planning and winter planning $PM_{2.5}$ emissions from these categories decrease. Please note that total PM emissions remain unchanged. Table 1 shows the change in the $PM_{2.5}$ emissions (tons/day) for both dairy and feedlot cattle dust in the SJV for 2000, 2005 and 2014.

Table 1: SJV Dairy and Feedlot Cattle Dust $PM_{2.5}$ Emissions (tpd)

	2000			2005			2014		
	Annual	Summer	Winter	Annual	Summer	Winter	Annual	Summer	Winter
Original $PM_{2.5}$	6.88	6.88	6.88	7.43	7.43	7.43	8.56	8.56	8.56
Revised $PM_{2.5}$	0.90	0.90	0.90	0.97	0.97	0.97	1.12	1.12	1.12
Change from Original	-5.98	-5.98	-5.98	-6.46	-6.46	-6.46	-7.44	-7.44	-7.44

4. Methodology Description

Table 2 shows the current annual average, summer planning and winter planning PM emissions (tons per day) for dairy and feedlot cattle dust in the SJV. To calculate the $PM_{2.5}$ emissions, multiply the PM emissions by the size fraction for the assigned PM profile code. As mentioned above, PM profile #900 assigns a weight fraction of 0.42 to $PM_{2.5}$. Table 3 shows the current annual average, summer planning and winter planning $PM_{2.5}$ emissions (tons per day) for dairy and feedlot cattle dust in the SJV.

Table 2: Current PM Emissions (tpd) for Cattle Dust

EIC	2000	2005	2014
620-618-0262-0101	7.88	9.18	11.88
620-618-0262-0103	8.50	8.50	8.50

Table 3: Current $PM_{2.5}$ Emissions (tpd) for Cattle Dust (Profile #900)

EIC	2000	2005	2014
620-618-0262-0101	3.31	3.86	4.99
620-618-0262-0103	3.57	3.57	3.57

The revised $PM_{2.5}$ emissions are calculated by multiplying the PM emissions by the size fraction for PM profile code 423. The PM profile code of 423 assigns a weight fraction of 0.055 to $PM_{2.5}$. Table 4 shows the revised annual average, summer planning and winter planning $PM_{2.5}$ emissions (tons per day) for dairy and feedlot cattle.

Table 4: Revised $PM_{2.5}$ Emissions (tpd) for Cattle Dust (Profile #423)

EIC	2000	2005	2014
620-618-0262-0101	0.43	0.50	0.65
620-618-0262-0103	0.47	0.47	0.47

5. Development of Off-Model Adjustments

No off-model adjustments were needed for these categories. The PM size cuts are applied to all PM emissions simultaneously during a later processing step.

6. Sample Calculations

No sample calculations are needed (see section 4. Methodology Description)

References

1. J.E. Houck, et al., "Determination of Particle Size Distribution Composition of Particulate Matter from Selected Sources in California", ARB Contract A6-175-32, OMNI Environmental Services, Inc., Beaverton OR, Desert Research Institute, Reno NV; June 1989.

Section I.3

Update to Size Cut Data for Dust from Food and Agriculture Processing Losses

1. Purpose

The distribution of dust emissions into different PM size cuts from processing losses occurring within food and agriculture operations was improved by reassigning the PM profile that is currently used (#900) to a more representative profile (#90003). A PM profile is an estimate of the fraction (weight percent) of source-specific PM considered to be within a specific particle size range. For example, a profile could identify the fraction of PM emissions from agricultural crop processing losses that is particulate matter less than 2.5 microns ($PM_{2.5}$).

The issue that prompted this improvement is that the currently assigned PM profile (#900) is an "unspecified" profile, which is only intended to be used as a default when more specific data are unavailable. Another PM profile (#90003) is more suitable for dust emissions from food and agriculture operations. The "unspecified" PM profile (#900) assigns a weight fraction of 0.42 to $PM_{2.5}$, while PM profile #90003 assigns a weight fraction of 0.14 to $PM_{2.5}$, thus reducing the amount of $PM_{2.5}$ emissions from these categories. PM profile #90003 is taken from the U.S. EPA Speciate 3.0 database and is based on work by G.S. Shareef, Radian, September 1987[1].

2. EIC Codes

CES	EIC	Description
47050	420-418-6000-0000	Agricultural Products Processing Losses
47076	420-420-6000-0000	Agricultural Crop Processing Losses

Emissions from this EIC are reported as both point and area sources. Reconciliation with point sources would be necessary at such time when the PM profile was to be changed within CEIDARS/CEFS.

3. Emission Inventory Changes from this Update

Annual average, summer planning and winter planning emissions of $PM_{2.5}$ from these categories decrease. Total PM emissions remain unchanged. Table 1 shows the change in the $PM_{2.5}$ emissions (tons/day) for dust from agricultural products processing losses and agricultural crop processing losses in the SJV for 2000, 2005 and 2014.

Table 1: SJV Food and Agriculture Processing Losses Dust Emissions (tpd)

	2000			2005			2014		
	Annual	Summer	Winter	Annual	Summer	Winter	Annual	Summer	Winter
Original $PM_{2.5}$	3.93	4.28	3.58	3.85	4.12	3.58	3.80	4.07	3.54
Revised $PM_{2.5}$	1.31	1.43	1.19	1.28	1.38	1.19	1.27	1.36	1.18
Change from Original	-2.62	-2.85	-2.39	-2.57	-2.74	-2.39	-2.53	-2.71	-2.36

4. Methodology Description

Table 2 shows the current annual average, summer planning and winter planning PM emissions (tons per day) for dust from agricultural products processing losses and agricultural crop processing losses in the SJV. To calculate the $PM_{2.5}$ emissions, multiply the PM emissions by the size fraction for the assigned PM profile code. As mentioned above, PM profile #900 assigns a weight fraction of 0.42 to $PM_{2.5}$. Table 3 shows the current annual average, summer planning and winter planning $PM_{2.5}$ emissions (tons per day) for agricultural processing losses in the SJV.

Table 2: Current PM Emissions (tpd) for Agricultural Processing Losses in SJV

	2000			2005			2014		
EIC	Annual	Summer	Winter	Annual	Summer	Winter	Annual	Summer	Winter
420-418-6000-0000	0.67	0.69	0.65	0.67	0.68	0.67	0.69	0.70	0.68
420-420-6000-0000	8.69	9.50	7.89	8.50	9.12	7.87	8.37	9.00	7.73

Table 3: Current $PM_{2.5}$ Emissions (tpd) for Agricultural Processing Losses (Profile #900)

	2000			2005			2014		
EIC	Annual	Summer	Winter	Annual	Summer	Winter	Annual	Summer	Winter
420-418-6000-0000	0.28	0.29	0.27	0.28	0.29	0.28	0.29	0.29	0.29
420-420-6000-0000	3.65	3.99	3.31	3.57	3.83	3.30	3.51	3.78	3.25

The revised $PM_{2.5}$ emissions are calculated by multiplying the PM emissions by the size fraction for PM profile code 90003. The PM profile code of 90003 assigns a weight fraction of 0.14 to $PM_{2.5}$. Table 4 shows the revised annual average, summer planning and winter planning $PM_{2.5}$ emissions (tons per day) for agricultural processing losses in the SJV.

Table 4: Revised $PM_{2.5}$ Emissions (tpd) for Agricultural Processing Losses (Profile #90003)

	2000			2005			2014		
EIC	Annual	Summer	Winter	Annual	Summer	Winter	Annual	Summer	Winter
420-418-6000-0000	0.09	0.10	0.09	0.09	0.10	0.09	0.10	0.10	0.10
420-420-6000-0000	1.22	1.33	1.10	1.19	1.28	1.10	1.17	1.26	1.08

5. Development of Off-Model Adjustments

No off-model adjustments were needed for these categories. The PM size cuts are applied to all PM emissions simultaneously during a later processing step.

6. Sample Calculations

No sample calculations are needed (see section 4. Methodology Description)

References

1. U.S. EPA, SPECIATE database, http://www.epa.gov/ttnchie1/software/speciate; Shareef, G.S.; Radian; September 1987.

Section I.4

Update to Temporal Data for Wildland Fire Use (WFU)

1. Purpose

A procedure was developed to improve the temporal representativeness of Wildland Fire Use (WFU) emissions. WFUs are wildfires that are allowed to burn to remove underbrush, particularly at National Parks and Forests.

The issue that prompted this improvement is that, based on the monthly temporal data in CEIDARS/CEFS, emissions from an entire WFU wildfire are allocated only to the single month when a fire begins, regardless of how many months it actually lasts. Thus, for fires that may in reality span multiple months, the method overstates emissions for the month that the fires begin; such that a large "spike" of emissions will appear in the inventory for that month.

In the current modeling inventory, the area source emissions are generated backward and forward in time from the 2002 CEIDARS database. Of particular concern were two large WFUs that occurred in 2002. One WFU was in Tuolumne County in July and another in August in Fresno County. As described above, high WFU emissions appear in Fresno and Tuolumne Counties in all years (whether 2000 or any future year). These WFUs actually happened in 2002 and were then backcasted to 2000 or forecasted to future years. Like all wildfires, it is unknown when WFUs will occur in future years or how large the emissions will be. Data show that most WFUs occur in summer, so the monthly throughputs were modified to spread the emissions evenly over the months of June, July, August and September.

2. EIC Codes Affected

CES	EIC	Description
90142	670-667-0200-000	Wildland Fire Use (WFU)

Emissions from this EIC are reported solely as area sources; no reconciliation with point sources is necessary.

3. Emission Inventory Changes from this Update

Annual average emissions from this category remain unchanged. Rather, the utilized procedure only affects the distribution of the annual emissions among months of the year. Since the summer planning inventory is based on the temporal data for May through October, the summer planning inventory will remain unchanged as well. Since data for November through April are not changed, the winter planning inventory also will not change. Table 1 below shows the changes to the PM2.5, NOx, SOx and ROG emissions (tons per

day) by county based on the revised temporal data using the equation shown in Section 6. Data for Tuolumne and Mariposa Counties are from v1.06 (Rf#980). Since there is no growth or control on this category, emissions for 2000, 2005 and 2014 are identical.

Table 1: Emission Changes by County

		Current				Revised			
		June	July	August	September	June	July	August	September
PM2.5	Fresno	.00	.00	25.9	.00	6.47	6.47	6.47	6.47
	Madera	.00	.37	.00	.00	0.09	0.09	0.09	0.09
	Tulare	.14	.00	.00	.00	.04	.04	.04	.04
	Tuolumne	.00	38.56	.00	.00	9.64	9.64	9.64	9.64
	Mariposa	.00	.024	.00	.00	.01	.01	.01	.01
NOx	Fresno	.00	.00	9.12	.00	2.28	2.28	2.28	2.28
	Madera	.00	.13	.00	.00	.03	.03	.03	.03
	Tulare	.06	.00	.00	.00	.02	.02	.02	.02
	Tuolumne	.00	14.05	.00	.00	3.51	3.51	3.51	3.51
	Mariposa	.01	.00	.00	.00	.00	.00	.00	.00
SOx	Fresno	.00	.00	2.81	.00	.70	.70	.70	.70
	Madera	.00	.04	.00	.00	.01	.01	.01	.01
	Tulare	.01	.00	.00	.00	.00	.00	.00	.00
	Tuolumne	.00	4.33	.00	.00	1.08	1.08	1.08	1.08
	Mariposa	.00	.00	.00	.00	.00	.00	.00	.00
ROG	Fresno	.00	.00	21.16	.00	5.29	5.29	5.29	5.29
	Madera	.00	.30	.00	.00	.08	.08	.08	.08
	Tulare	.12	.00	.00	.00	.03	.03	.03	.03
	Tuolumne	.00	31.25	.00	.00	7.81	7.81	7.81	7.81
	Mariposa	.00	.02	.00	.00	.01	.01	.01	.01

4. Methodology Description

The only change is to the relative monthly throughputs for WFUs in Fresno, Madera, Tulare, Tuolumne and Mariposa Counties. These are the only counties that have emissions in this category in 2002. Table 2 shows the current monthly throughputs.

Table 2: Current Monthly Throughputs

County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fresno	0	0	0	0	0	0	0	100	0	0	0	0
Madera	0	0	0	0	0	0	100	0	0	0	0	0
Tulare	0	0	0	0	0	100	0	0	0	0	0	0
Tuolumne	0	0	0	0	0	0	100	0	0	0	0	0
Mariposa	0	0	0	0	0	0	100	0	0	0	0	0

External adjustment factors were calculated (see Section 5 below) to adjust the emissions as if the monthly throughputs were as shown in Table 3 below.

Table 3: Revised Monthly Throughputs

County	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fresno	0	0	0	0	0	25	25	25	25	0	0	0
Madera	0	0	0	0	0	25	25	25	25	0	0	0
Tulare	0	0	0	0	0	25	25	25	25	0	0	0
Tuolumne	0	0	0	0	0	25	25	25	25	0	0	0
Mariposa	0	0	0	0	0	25	25	25	25	0	0	0

5. Development of Off-Model Adjustments

The external adjustment factors are multiplied by the current gridded emissions to incorporate the desired change in the inventory. The factors are calculated for a given county, month, year and pollutant. To reflect the revised monthly throughputs given in Table 3, ratios were calculated from current throughputs to the revised throughputs by county. The same ratio is applied to all pollutants and years.

For the month when a WFU is reported to burn, the factor is calculated as:

$$\frac{\text{Revised throughput}}{\text{Current throughput}} = \frac{100/4}{100} = 0.25$$

For the other three months when a WFU is not reported to burn, the factor is calculated as:

$$\frac{\text{Revised throughput}}{\text{Current throughput}} = \frac{100/4}{0.01^*} = 2500$$

*The monthly throughputs reported as “0” in Tables 2 and 3 are really 0.01.

Table 4 shows the external adjustment factors for each of the five counties.

Table 4: External Adjustment Factors by County and Month

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Fresno	1.000	1.000	1.000	1.000	1.000	2500.000	2500.000	0.250	2500.000	1.000	1.000	1.000
Kern	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Kings	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Madera	1.000	1.000	1.000	1.000	1.000	2500.000	0.250	2500.000	2500.000	1.000	1.000	1.000
Merced	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
San Joaquin	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Stanislaus	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Tulare	1.000	1.000	1.000	1.000	1.000	0.250	2500.000	2500.000	2500.000	1.000	1.000	1.000
Tuolumne	1.000	1.000	1.000	1.000	1.000	2500.000	0.250	2500.000	2500.000	1.000	1.000	1.000
Mariposa	1.000	1.000	1.000	1.000	1.000	2500.000	0.250	2500.000	2500.000	1.000	1.000	1.000

6. Sample Calculations

The algorithm to calculate month-specific emissions in CEFS is as follows:

$$\text{Daily Emissions} = \frac{\text{EMS}}{365} * \frac{\text{Monthly Throughput}}{(1/12)} * \frac{\text{DAYFACTOR}}{(1/7)} \quad \text{(Equation 1)}$$

The monthly throughput stored in CEIDARS/CEFS is multiplied by 100 for ease of reporting, so the monthly throughputs reported in CEFS must be divided by 100 before use in the calculation. AYFACTOR varies depending on the weekly cycle code (DPWK) and whether a weekday or a weekend day is desired. When the weekly cycle code = 7, DAYFACTOR = 1/7 cancelling out any emissions adjustment for day of week.

Current Calculations

Annual average PM emissions in Fresno County in 2000 from WFUs are 3.633 tpd. Table 2 places virtually all the emissions in August. The weekly cycle code for this category is 7. Use the equation above to calculate the August and July weekday (WD) emissions. All months will be equivalent to July except August.

August WD = 3.633 * 1.00/.08333 * 1 = 43.6 tpd PM

July WD = 3.633 * .0001/.08333 * 1 = 0.00436 tpd PM

Revised Emissions

The annual average PM emissions remain unchanged (3.633 tpd in Fresno). Multiply the August WD emissions by 0.25, the factor shown in Table 4 for Fresno in August. Multiply the July WD by 2500, the factor shown in Table 4 for Fresno in July. June and September will be the same as July. The sum of emissions in June, July, August and September will total the original amount assigned only to August (i.e. 10.9 * 4 = 43.6). The other months remain unchanged.

Revised August WD = 43.6 * 0.25 = 10.9 tpd PM

Revised July WD = .00436 * 2500 = 10.9 tpd PM

Section I.5

Update to Manufacturing and Industrial – Industrial Natural Gas Combustion

1. Purpose

This methodology is used to estimate area source emissions from the combustion of natural gas by industrial sources not covered in our point source inventory or other area source categories. This estimation does not include natural gas used for cogeneration or oil and gas extraction as these sources are covered in other categories. The emissions for the "unspecified" manufacturing and industrial natural gas consumption sources come from an estimate developed in the early 1990's. District staff recently reviewed this category and could find no documentation substantiating the existing estimates. Therefore the District staff developed a new methodology for estimating emissions and has submitted it to ARB for review and inclusion in future inventories.

2. EIC Codes Affected

CES	REIC	Description
66787	050-040-0110-000	Industrial Stationary – I.C Engines- Natural Gas
47142	050-995-0110-0000	Industrial Natural Gas Combustion (Unspecified)

These EIC categories need to be reconciled with the appropriate point source inventory. ARB and the District use different reconciliation methods and are in the process of evaluating which is the most appropriate method to use at this time.

3. Emission Inventory Changes from this Update (SJV PM2.5 V-1.0)

The table below shows the changes to the NOx and PM emissions inventory, in tons per day, based on this new methodology. ARB staff has compared the new estimates with estimates from similar sources in other air districts and the new estimates compares well with other district data. Reductions associated with CO, SOx, and VOC, were very small and will be updated in the next inventory cycle. Emission estimates provided by the district were used in the planning inventory calculations and may vary slightly from what is presented here.

	2000			2005			2014		
	NOX	**PM10**	**PM2.5**	**NOX**	**PM10**	**PM2.5**	**NOX**	**PM10**	**PM2.5**
Industrial Stationary I.C. Engines	5.323	0.002	0.002	1.420	0.014	0.014	1.817	0.016	0.016
Revised Estimate	0.004	0.000	0.000	0.001	0.000	0.000	0.002	0.000	0.000
Industrial Nat. Gas Comb. - Unspecified	23.358	0.195	0.195	26.298	0.237	0.237	30.398	0.281	0.281
Revised Estimate	0.847	0.032	0.032	1.002	0.037	0.037	1.200	0.044	0.044

4. Methodology Description

The industrial sector consumes natural gas for process use, boiler fuel, space heat, electricity generation, and feedstock. The combustion of natural gas in the industrial sector of the San Joaquin Valley Air Basin can be divided into two categories: 1) stationary internal combustion engines (reciprocating engines and turbines) and 2) unspecified. The "unspecified" category includes the combustion of natural gas in heaters, boilers, and burners. This methodology estimates emission from industrial equipment for which natural gas consumption or emissions are not reported for individual sources. In short, these are sources too small to fall into the district permitting program. Without permit data, emissions from these sources must be estimated from other information.

The methodology uses 2005 natural gas deliveries reported to the California Energy Commission (CEC), beyond that used by permitted stationary sources in the Valley, to estimate the emissions from combustion of that natural gas. For emission estimation purposes, this natural gas is assumed to be combusted in small uncontrolled industrial boiler (unspecified) and 4-stroke lean-burn engines (reciprocating engines), and uses U. S. EPA's AP-42 emission factors.

a. Activity Data

The total amount of natural gas consumed in the industrial sector for each county for 2005 was obtained from the CEC. The area source consumption is the difference between the total District consumption and the point source consumption. The area source consumption is further split into the reciprocating engines and unspecified categories. 84% of natural gas consumption in the industrial sector was for those devices in the "unspecified" category and 6% was consumed for reciprocating engines.

b. Emission Factors

Combustion Process	Emissions (lbs per million cubic feet)				
	NOx	CO	SOx	VOC	PM
Reciprocating Engines	4.08	0.317	0.00059	0.118	0.0099
Unspecified	100	84	0.6	5.5	7.6

c. Temporal Variation

Daily: ARB Code 24. 24 hours per day-uniform activity during the day
Weekly: ARB Code 7. 7 days per week – uniform activity every day of the week
Monthly: Monthly activity in California is relatively uniform.

d. Spatial Variation

Industrial natural gas deliveries in 2005 for each county in the SJV were provided by the CEC. Within each county, activity can be assigned to parcels zoned for industrial activity.

e. Chemical Speciation

Profile Description	ARB Profile #		Fractions			
	Organic Gas	PM	ROG	VOC	PM10	PM2.5
Stationary IC Engine – Natural Gas		123			0.994	0.992
Internal Combustion Engines- Reciprocating – Natural Gas	719		0.091428	0.091428		
Gaseous Material Combustion		120			1	1
External Combustion Boiler- Natural Gas	3		0.422181	0.422181		

5. Development of Off-Model Adjustments

To reflect the emission reductions from the new area source methodology, ratios were calculated from old and new emissions by county, pollutant and year and applied to the modeling inventory using the Districts reconciliation method of point sources. The spreadsheet with the actual calculations can be requested from the ARB {ExternalAdjustments_PM2.5_FINAL_with documentation.xls}

Section I.6

Update to Cooking

1. Purpose

This methodology estimates area source emissions from commercial cooking operations. It is based on a methodology developed by E.H. Pechan & Associates, Inc. (Pechan 2005) for the San Joaquin Valley Unified Air Pollution Control District. District staff recently reviewed this category and could find no documentation substantiating the existing estimates. Therefore the District staff developed a new methodology for estimating emissions and has submitted it to ARB for review and inclusion in future inventories.

2. EIC Codes Affected

CES	REIC	Description
60418	690-680-6000-0000	Commercial Charbroiling
66811	690-682-6000-0000	Commercial Deep-Fat Frying
82180	690-684-6000-0000	Other Commercial Cooking

These EIC categories need to be reconciled with the appropriate point source inventory. ARB and the District use different reconciliation methods and are in the process of evaluating which is the most appropriate method to use at this time.

3. Emission Inventory Changes from this Update (SJV PM2.5 V-1.0)

The table below shows the changes to the PM10 and PM2.5 emissions inventory, in tons per day, based on this new methodology. Emission estimates provided by the district were used in the planning inventory calculations and may vary slightly from what is presented here.

	2000		2005		2014	
	PM10	PM2.5	PM10	PM2.5	PM10	PM2.5
Commercial Charbroiling	1.286	0.772	1.333	0.800	1.523	0.914
Revised Estimate	3.286	1.972	3.402	2.041	3.889	2.334
Commercial Deep Fat Frying	0.652	0.391	0.728	0.437	0.836	0.501
Revised Estimate	0.000	0.000	0.000	0.000	0.000	0.000
Other Commercial Cooking	0.000	0.000	0.000	0.000	0.000	0.000
Revised Estimate	0.000	0.000	0.000	0.000	0.000	0.000

4. Methodology Description

This methodology estimates PM and VOC emissions coming from food for these three categories of commercial cooking operations in the SJV Air Basin; 1) commercial charbroiling, 2) deep-fat frying, and 3) other commercial cooking, which includes clamshell and flat griddles. This methodology uses the number of restaurants listed in each county as surrogates for determining the number of cooking devices and the amount of food cooked in each county. The amount of food cooked on each device is multiplied by the appropriate emission factor to determine the emissions from each meat type on each cooking device. These are then summed for county level emissions.

a. Activity Data

Number of restaurants: The restaurants were obtained from Dun and Bradstreet's online database www.zapdata.com and were identified by their SIC codes.

Cooking equipment: The fraction of restaurants using different types of cooking equipment and the average pieces of equipment used in each of these restaurants was derived from a CARB sponsored survey.

Process Rates: Emissions estimates are based upon commercial cooking of meats and potatoes. The average weekly pounds of meat cook by equipment type was described by Potepan (2001).

b. Emission Factors

Emission factors for commercial cooking processes were obtained from the 2002 National Emissions Inventory (US EPA 2002b). These emission factors were based on a study performed by Welch and Norbeck (1998).

c. Temporal Variation

Daily: ARB Code 38. 24 hours per day-uniform activity during the day

Weekly: ARB Code 7. 7 days per week – uniform activity every day of the week

Monthly: Monthly activity in California is relatively uniform.

d. Spatial Variation

The number of restaurants in 2005 for each county in the SJVAPCD was obtained from Dun and Bradstreet. Spatial distribution should reflect commercial land use patterns.

e. Chemical Speciation

Profile Description	ARB Profile #		Fractions			
	Organic Gas	PM	ROG	VOC	PM10	PM2.5
Unspecified		900			0.7	0.42
Species unknown – all category composite	600		0.6986	0.6986		

5. Development of Off-Model Adjustments

To reflect the emission reductions from the new area source methodology, ratios were calculated from old and new emissions by county, pollutant and year and applied to the modeling inventory using the Districts reconciliation method of point sources. See description in Section 1.5 Update to Manufacturing and Industrial Natural Gas Combustion, part 5. Development of Off-Model Adjustments.

6. Sample Calculations

Calculation Steps for Emissions from Underfired Charbroilers in Fresno County

Step 1 – For each restaurant type, multiply the number of facilities by the fraction of each type of cooking equipment expected to be in the restaurants. (Ethnic, Family, Fast Food, Seafood, and Steak & BBQ)

Step 2 – For each restaurant and equipment type, multiply the number of restaurants by the average number of pieces of equipment expected to be in the restaurants. (Auto charbroilers, Underfired charbroilers, Deep-fat fryer, Flat griddles, and Clamshell griddles)

Step 3 – Sum the number of pieces of cooking equipment across restaurant types

Step 4 – For each meat type, multiply the total number of underfired charbroilers by average pounds of meat cooked per year. (Steak, Hamburger, Poultry, Pork, Seafood, and other meat)

Step 5 – Multiply the mass of meat by the appropriate emission factor and convert emissions to tons per year.

Step 6 – Sum the emissions from each meat category within each device type to get the total emissions from each device.

Section I.7

Update to Paved Road Dust

1. Purpose

The changes to the paved dust categories are in two areas. The first is to remove on-road motor vehicle exhaust, tire wear and brake wear from the paved road dust emissions to eliminate double-counting. Currently, the emissions from paved road dust in ARB's inventory include PM emissions from on-road motor vehicles. This calculation was based on earlier versions of AP-42. In the current version of AP-42[1], the equation to calculate PM emissions from paved road dust includes the subtraction of exhaust, tire wear and brake wear. Those emissions are already included in the emissions generated by EMFAC, so including them constitutes a double-counting of those emissions. ARB chose to remove the vehicle PM emissions from the paved road dust emission estimates.

The other change is to revise the rate at which the emissions are grown from a base year to a future year. Previously, the paved road dust emissions were forecasted using the growth in VMT by roadway classification as provided by the SJV transportation agencies. ARB staff felt that a limit should be placed on the growth of paved road dust emissions since some of the dust is entrained on the roadway rather than new dust being created as more vehicle-miles are driven. This limit was included by growing the emissions by the lane miles of new road.

2. EIC Codes Affected

CES	EIC	Description
83618	640-635-5400-0000	Paved Entrained Road Dust - Freeways
83626	640-637-5400-0000	Paved Entrained Road Dust – Major Streets
83634	640-639-5400-0000	Paved Entrained Road Dust – Collector Streets
83624	640-641-5400-0000	Paved Entrained Road Dust – Local Streets

Emissions from this EIC are reported solely as area sources; no reconciliation with point sources is necessary.

3. Emission Inventory Changes from this Update

Table 1 shows the paved road dust emissions before and after the removal of the vehicle PM emissions for the 2000 annual average inventory. Emissions used in the modeling were similar to those shown below. Since the actual calculations were done for each day of the 14-month episode, by county and by grid cell, the

emissions are not shown here. Changes in the emissions would be of similar magnitude.

Table 1 2000 PM Paved Road Dust Emissions

Area	2000 PM-Paved Road Dust	2000 TBE PM	2000 PM - 2000 TBE PM
FRESNO	22.766	2.905	19.861
KERN	17.678	4.822	12.856
KINGS	4.199	0.948	3.251
MADERA	4.522	0.650	3.872
MERCED	6.924	1.976	4.948
SAN JOAQUIN	15.716	1.933	13.783
STANISLAUS	10.029	1.284	8.745
TULARE	9.318	1.042	8.276
TOTAL	91.152	15.560	75.592

Based on the methodology shown below, Table 2 displays the adjusted annual average PM2.5 emissions for 2005 and 2014. Table 3 shows the change from CEFS.

Table 2 Adjusted Paved Road Dust PM2.5 Emissions

AREA	2005	2014
FRESNO	1.403	1.492
KERN	0.906	0.952
KINGS	0.238	0.273
MADERA	0.268	0.272
MERCED	0.347	0.360
SAN JOAQUIN	0.935	0.939
STANISLAUS	0.623	0.662
TULARE	0.585	0.608
TOTAL	5.306	5.558

Table 3 Changes from Original Emissions

	2005	2014
PM2.5 CEFSv1.00	6.686	7.718
Decrease	21%	28%
PM2.5 CEFSv1.06	7.524	8.686
Decrease	29%	36%

4. Methodology Description

Rather than calculate external adjustment factors like all the other categories, adjustments to paved road dust emissions were calculated on a grid cell basis. First, the adjusted 2000 PM emissions were calculated for each county. A ratio of the adjusted emissions to the original emissions was then applied to each grid cell in the appropriate county in the SJV. The following equation was used to calculate each county's ratio:

Adjusted 2000 PM emissions = (Total PM in 2000 – TBE) x (Change in Lane Miles)

where TBE = the sum of the PM exhaust, tire wear and brake wear emissions from all on-road motor vehicles for a county; and
Total PM = the sum of the PM from the paved road dust categories for a county

Earlier, rates of growth in county-level VMT values were used as surrogates to forecast paved road dust emissions. The purpose of the currently prepared adjustments is to use the growth in lane-miles as surrogates for forecasting.

For estimation of the growth factors lane miles from Caltrans HPMS[2] data library was used for calendar years 2001-2006. For other years of interest (i.e., 1999-2000 and 2009-2014), linear regression was used for estimation as also suggested by Ms. Soheila Khoii of Caltrans. Table 4 shows the growth in lane miles from calendar year 2000.

Table 4 Growth of Lane Miles from 2000

Year	FRESNO	KERN	KINGS	MADERA	MERCED	SAN JOAQUIN	STANISLAUS	TULARE
1999								
2000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2001	1.0072	1.0007	1.0168	1.0013	1.0091	0.9991	1.0098	1.0029
2002	1.0113	1.0113	1.0230	1.0006	1.0088	0.9984	1.0126	1.0065
2003	1.0232	1.0228	1.0597	1.0081	1.0087	0.9987	1.0175	1.0144
2004	1.0285	1.0267	1.0692	1.0081	1.0116	1.0047	1.0345	1.0304
2005	1.0300	1.0278	1.0679	1.0081	1.0213	0.9891	1.0386	1.0304
2006	1.0425	1.0295	1.1003	1.0081	1.0313	1.0003	1.0427	1.0204
2007	1.0476	1.0396	1.1123	1.0114	1.0303	0.9968	1.0519	1.0350
2008	1.0544	1.0452	1.1283	1.0131	1.0346	0.9963	1.0593	1.0400
2009	1.0612	1.0509	1.1444	1.0147	1.0390	0.9959	1.0667	1.0450
2010	1.0680	1.0566	1.1604	1.0163	1.0433	0.9954	1.0742	1.0500
2011	1.0747	1.0622	1.1765	1.0180	1.0476	0.9950	1.0816	1.0550
2012	1.0815	1.0679	1.1925	1.0196	1.0519	0.9945	1.0890	1.0601
2013	1.0883	1.0735	1.2086	1.0212	1.0563	0.9940	1.0964	1.0651
2014	1.0951	1.0792	1.2246	1.0229	1.0606	0.9936	1.1038	1.0701

A size fraction of 0.0686 was applied to the total PM emissions to calculate PM2.5 emissions. This size fraction is taken from work prepared for the Western Regional Air Partnership[3]. The emissions shown in Tables 2 and 3 use this fraction.

5. Development of Off-Model Adjustments

No external adjustment factors were developed.

6. Sample Calculations

Calculate the adjusted PM2.5 emissions for Fresno in 2005:

- From the last column in Table 1, read the total PM emissions with the vehicle PM emissions removed (column: 2000 PM - 2000 TBE PM).
- Multiply these emissions by the growth rate for 2005 in Fresno County from Table 4.
- Lastly, calculate PM2.5 by multiplying the size fraction.

19.861 tpd PM x 1.0300 x 0.0686 = 1.403 tpd PM2.5 (as shown in Table 2)

Similarly, the adjusted PM2.5 emissions for San Joaquin County in 2014:

13.783 tpd PM x 0.9936 x 0.0686 = 0.939 tpd PM2.5 (as shown in Table 2)

References

1. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, AP-42, Section 13.2.2, Fifth Edition. December 2003. http://www.epa.gov/ttn/chief/ap42/ch13/

2. California Department of Transportation, Highway Performance Monitoring System (HPMS). http://www.dot.ca.gov/hq/tsip/hpms/index.php

3. Western Regional Air Partnership. http://www.wrapair.org/